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Chemical Residues in Fish From Five Rivers in Southern Alberta

Alberta
ENVIRONMENTAL CENTRE

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CHEMICAL RESIDUES IN FISH FROM FIVE RIVERS IN SOUTHERN ALBERTA

Alberta Environmental Centre
Vegreville, Alberta

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ABSTRACT

The purpose of this investigation was to describe the concentrations of PCB and 43 pesticides in fish collected from the Bow River, South Saskatchewan River, Oldman River, Crowsnest River and St. Mary River, located in southern Alberta. Approximately 500 fish, mainly rainbow trout, brown trout, mountain whitefish, lake whitefish, walleye, sauger, northern pike and various sucker species, were collected. It can be concluded that:

1. The concentration of pesticides and PCBs in the edible muscle tissue of fish from all five rivers is low, often less than the level of detection. Samples from the Oldman River near the Town of Pincher Creek did not contain significant levels of either PCBs or pesticides.
2. Since none of the compounds pose a threat to human consumers, there is no need to place consumption limits on any species.
3. Within the pesticide group, chlordane was most common, followed by DDE, α-BHC and DDD. Since the use of these agents is declining, residues in fish will also decline.
4. There is no need for routine monitoring of pesticide and PCB residues in the five rivers. However, analysis should be reconducted in approximately 5 years to ensure that levels are still low.

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
1. INTRODUCTION	1
2. METHODS	3
2.1 Bow River	3
2.2 South Saskatchewan River	3
2.3 Oldman and Crowsnest River	4
2.4 St. Mary River	5
3. CHEMICAL ANALYSES	5
4. RESULTS	8
5. DISCUSSION	11
REFERENCES	14
APPENDICES	15

000005

000006

1. INTRODUCTION

The Alberta Environmental Centre began a comprehensive program of chemical analysis of fish tissues in 1980 in response to a request from Energy and Natural Resources (Fish and Wildlife Division). Initially, fish were collected from approximately 15 major lakes and rivers for analysis of 43 pesticides, their derivatives, PCB (Aroclor 1254, 1260, 1242), methylmercury, and inorganic mercury. Our findings to date indicate that phenoxy, organophosphate and carbamate pesticides generally occur at non-detectable levels in tissues in all systems (AEC, 1983a-c). Although PCB and some chlorinated pesticides are ubiquitous, their concentrations are relatively low and meet safe consumption limits. In the North Saskatchewan River, several species of fish are significantly contaminated with mercury, which limits their use as a human food source (AEC, 1983b). Subsequent reports in this series will deal with aromatic hydrocarbons, methoxychlor and its breakdown products in fish from the Athabasca River.

The purpose of this report is to describe chemical residue data for fish collected from four rivers in southern Alberta: the Bow River, South Saskatchewan River, Oldman River and St. Mary River (Figure 1). Analysis was completed on muscle and intestinal fat tissue from several different species, including rainbow trout Salmo gairdneri, brown trout Salmo trutta, mountain whitefish Prosopium williamsoni, walleye Stizostedion vitreum, sauger Stizostedion canadense, pike Esox lucius, white sucker Catostomus commersoni, longnose sucker Catostomus catostomus, lake whitefish Coregonus clupeaformis, ling Lota lota, and lake sturgeon Acipenser fulvescens.

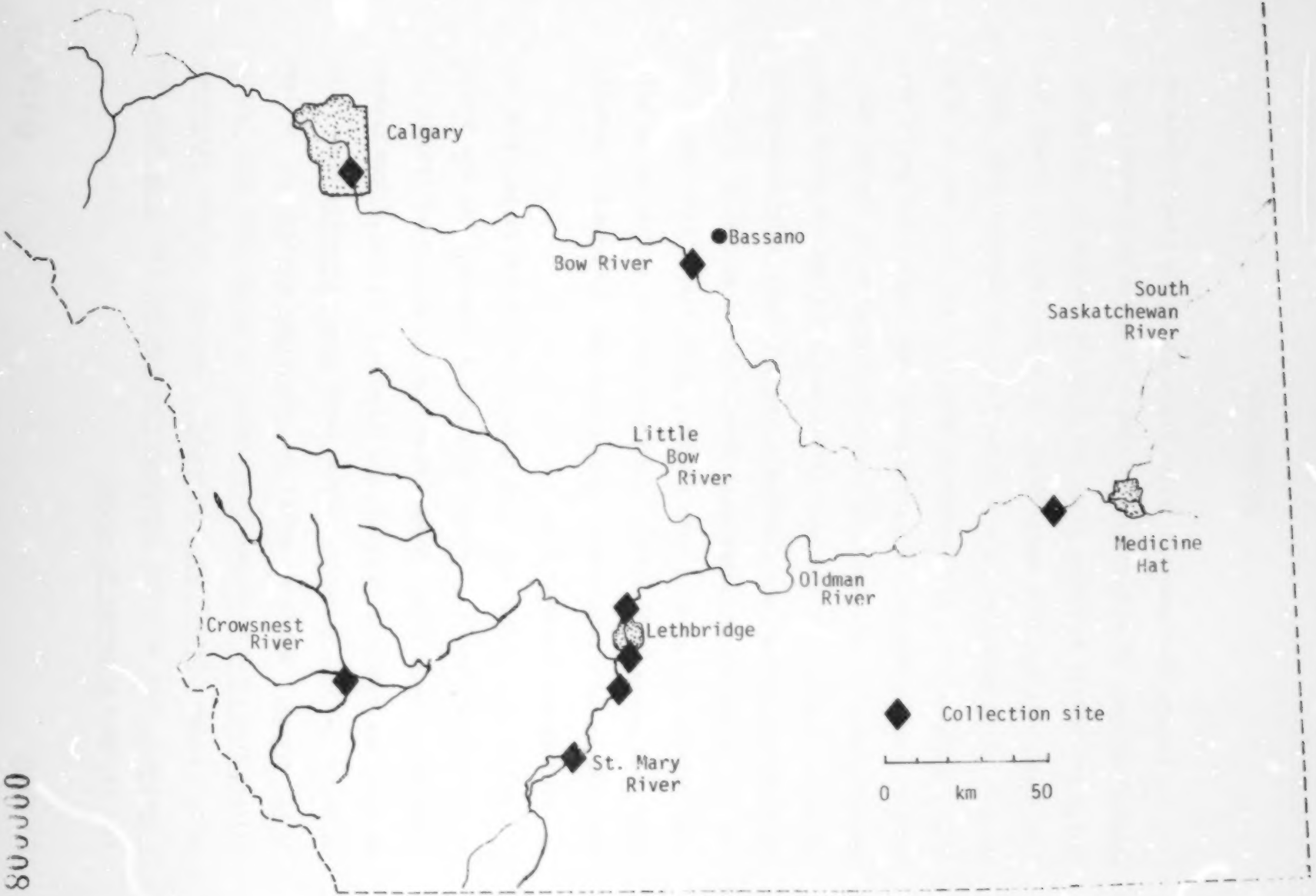

Figure 1. Map of study area showing collection sites.

2. METHODS

2.1 Bow River

This river was selected for study because of the possibility of chemical contamination of fish stocks below the City of Calgary. The river originates in Bow Lake, some 80 km north of Banff. From there it flows in an easterly direction, through Calgary to its confluence with the South Saskatchewan River (Figure 1). Average annual discharge at Calgary is 92 m^3/sec, with seasonal extremes of 43 and 243 m^3/sec.

Fish were collected by electroshocking at Calgary during November 1982 and south of Bassano during August 1982 (Figure 1). The fish were transported alive to storage freezers within 8 hours of capture and immediately frozen at -20°C. Prior to chemical analysis (Section 3), one sample of muscle and one of intestinal fat was collected from each fish. Muscle (approximately 250 g wet weight), including both hypaxial and epaxial tissues, was obtained using a stainless steel filleting knife and then wrapped in aluminum foil. Approximately 5 g wet weight of intestinal fat was also obtained using a stainless steel surgical knife and wrapped in foil. The muscle and fat samples were then labelled, placed in plastic bags and frozen to -20°C pending analysis.

2.2 South Saskatchewan River

The South Saskatchewan River originates at the confluence of the Bow and Oldman Rivers (Figure 1). It was selected for study because of the possibility of pesticide contamination due to the

surrounding land-use and input from tributary rivers. Fish were collected at one site situated approximately 20 km upstream of Medicine Hat where river discharge averaged 206 m^3/sec (range 67-418 m^3/sec). The samples were taken on 22-23 August 1980 and 24-25 August 1982 using hand lines, set lines, gill nets and electroshocking and frozen soon after capture. In addition, one (1) sturgeon was confiscated from a fisherman.

2.3 Oldman River and Crowsnest River

The Oldman River originates some 130 km south of Banff and flows in a generally easterly direction to its confluence with the South Saskatchewan River (Figure 1). It was selected for study to obtain background information on the level of chemical adulteration in a relatively uncontaminated watershed. The Oldman River receives a number of tributaries, one of which is the Crowsnest River (Figure 1). It is situated approximately 15 km northwest of Pincher Creek and has an average annual discharge of 5 m^3/sec. Fish samples were collected in the Crowsnest River at its confluence with the Oldman on 27 August 1982. The fish were taken by electroshocking and frozen as soon as possible after capture. Samples were also collected from the Oldman River in an area extending from the mouth of the St. Mary River to a point ~10 km downstream of the City of Lethbridge. The fish were taken on 18 July, 31 July and 1 August 1980 and 18, 19 and 31 August 1982 by angling and electroshocking.

2.4 St. Mary River

This river was selected for study because of the possiblity of pesticide contamination due to surrounding land-use. The river originates in Montana, U.S.A. and flows in a northeastward direction to its confluence with the Oldman River. The St. Mary reservoir, with a length and width of 15 and 7 km respectively, is situated some 150 km upstream of the Oldman River. During August 1980, fish were caught by gill net at the confluence of the St. Mary and Oldman Rivers, whereas in 1982 (22 July, 31 August) they were taken by electroshocking in an area immediately below the St. Mary Reservoir to a point approximately 3 km downstream. Both collections were frozen within 8 hours of capture at -20°C.

3.0 CHEMICAL ANALYSES

The analytical method used to determine pesticide and PCB residues is given below:

Muscle:

1. 25 g of the muscle (without skin, scale and bone) was weighed into a 250 ml beaker, and 100 ml of distilled acetonitrile added.
2. Using a Polytron grinder, the muscle was ground in the solvent and then filtered in vacuum.
3. The filtrate was transferred to a 1-litre separatory funnel with 150 ml of petroleum ether. 600 ml of petroleum ether was washed with distilled water and about 5 g of NaCl were added to the separatory funnel and shaken well.

4. The separated petroleum ether layer was dried by passing it through a pad of anhydrous sodium sulfate, and the filtrate evaporated to near-dryness. The moist residue was reconstituted in a minimum amount of petroleum ether and subjected to column chromatography.

5. A chromatography column with 50 g of Florisil containing 5% water was prepared and the concentrate was applied onto the column. 200 ml of petroleum ether was poured onto the column and the "Petroleum Ether Fraction" was eluted. This fraction contains very non-polar compounds such as HCB, DDE, DDT, and PCB's. Then 275 ml of petroleum ether containing 25% methylene chloride was poured in and the Fraction II was eluted. This fraction contains slightly polar compounds such as α, β, γ-BHC, HE, Dieldrin, Endrin, and DDD.

6. Each fraction was evaporated to near-dryness and reconstituted with a small volume of hexanes (eg. 5-10 ml) and a small portion (eg. 5 µl) of this solution was injected to a gas chromatograph with an electron capture detector. A gas chromatogram thus obtained was compared to the standard pesticide gas chromatogram run along with the sample and by comparing the peak height of each pesticide, the quantities of pesticide in the sample were calculated and expressed in ppm.

Fat:

1. One gram of fat was weighed out and ground in a mortar with 25 g of Florisil containing 5% water and some anhydrous sodium sulfate.

2. A chromatography column was first prepared with 25 g of Florisil containing 5% water, then the above sample with Florisil was added on top of it.
3. The petroleum fraction I was obtained by eluting with 250 ml of petroleum ether and the fraction II obtained by eluting with 275 ml of petroleum ether containing 25% methylene chloride.
4. Detection and quantification of the pesticide by gas chromatogram is the same as the muscle samples.

Precision and accuracy:

1. Detection limit (based on 25 g samples)
   - organochlorines, 0.001 ppm
   - PCB's, 0.02 ppm (without perchlorination)
     0.002 ppm (with perchlorination)
2. Recoveries from fortified fish muscle
   - organochlorines and PCB's, >80%
3. Accuracy:

Concentration of PCB's/organochlorine (mg/kg)	Limit of accuracy
1.0	± 10%
0.1	± 20%
0.01	± 50%
0.001	±100%

(according to Gunther, 1970)

4. Reproducibility (Precision):
   - ±10%

4. RESULTS

Of the compounds listed in Table 1, only 10 pesticides (HCB, α-BHC, lindane, DDE, DDT, DDD, heptachlor epoxide, dieldrin, oxychlordane and chlordane), and PCBs were found in the fish (Appendices 1-5). PCB occurred in greatest concentration in the Bow River, averaging 2.6-7.0 mg/kg in the fat of various species (Table 2). Although moderate levels (20-56 mg/kg) were also found in the South Saskatchewan River, residues in fish inhabiting the Crowsnest River were always low (Table 2). PCBs in the edible muscle tissue from all five rivers generally ranged from <0.01 to 0.5 mg/kg.

Chlordane was the most common pesticide in fish from the Bow, South Saskatchewan, Oldman and St. Mary Rivers. Residues in the muscle tissue of fish generally ranged from 0.001 to 0.010 mg/kg compared to 0.1-0.9 for fat samples. The next most common compound in all four systems was DDE, followed by α-BHC and DDD.

Table 1. List of organic compounds determined in this study.

Chlorinated Compounds (detection unit 0.005 ppm)	Organo-phosphate Pesticides (0.05 ppm)	Phenoxy Pesticides (0.05 ppm)
HCB (hexachlorobenzene)	Parathion	MCPA (metachlorophenoxy acetic acid)
γ, β, α HCH (hexachlorocyclohexane, or BHC)	Diazinon	2, 4-D
Heptachlor	Sumithion	2, 4, 5-T
Heptachlor epoxide	Malathion	Picloram
Chlordane (cis)	Ethion	MCPB (metachlorophenoxy butyric acid)
Oxychlordane	Dioxythion	Silvex
Aldrin	EPN (O-ethyl, O-4-nitro-phenyl phenyl phospheno-thiolate)	Dicamba
Dieldrin		Pentachlorophenol
PP^1DDT		
p,p^1-DDE, p,p^1-DDD		
Dicosol	Dursban	Other (0.05 ppm)
Aroclor 1254, 1260, 1242		Tedion
Polybrominated Biphenyls		Daconil
Mirex		
Pentachlorobenzene		
Toxaphene		
Methoxychlor		
Perthane		
Telodrine		
PCNB (Pentachloronitrobenzene)		
TCNB (Tetrachloronitrobenzene)		
Endosulfan		
Thiodan I		
Endrin		

000015

Table 2. Average concentration (mg/kg wet weight) of PCBs in intestinal fat from different species of fish in the five study rivers.

FISH SPECIES	RIVER				
	Bow	South Saskatchewan	Oldman	Crowsnest	St. Mary
Walleye	7.0	2.2	4.4	-	4.4
Northern Pike	6.6	5.6	1.9	-	-
Rocky Mountain Whitefish	6.3	-	1.5	<0.1	-
White Sucker	9.4	-	0.7	-	-
Longnose Sucker	4.1	-	0.1	-	-
Sauger	2.6	4.5	4.8	-	-
Goldeye	-	2.0	0.5	-	-
Brown Trout	3.5	-	-	<0.1	-
Rainbow Trout	5.0	-	-	<0.1	-

dash, species not collected from river.

5. DISCUSSION

Since residues in fish from all five rivers were low, there is no need to establish consumption limits for any species. For example, PCB levels in the edible muscle tissue of fish averaged <0.1 mg/kg and were often below detectable limits, compared to the maximum consumption standard of 2.0 mg/kg. Relatively high levels were found in intestinal fat samples, particularly in fish from the South Saskatchewan River. Since it is unlikely that anyone would eat this part of the fish, such levels probably pose no threat to consumers.

Although PCB production has been discontinued for more than 10 years, PCBs are still used in a wide variety of applications, particularly in electrical capacitors and transformers. These devices are susceptable to rupture and currently there are no methods available to predict failure of either capacitors or transformers. In the event of failure, PCB-containing fluid may eventually find its way into surface waters. Most other industrial products in current use do not contain PCBs. Drilling fluids were, at one time, potential sources of contamination in southern Alberta. Since the half-life of PCB's in surface waters is long (5-15 years), spilled material would still contribute to residues in the food chain.

Chlordane is a chlorinated insecticide, with a high bioconcentration factor in fish (20000-40000) and long half life (10-40 days). It is moderately toxic to fish (96hLC_{50}, 0.05 mg/ℓ) and a suspected human carcinogen. Maximum production of chlordane in North America occurred in 1974. However uses and production volume have decreased extensively since the issuance of restrictions in both Canada

and the USA. Although chlordane is no longer used in large amounts in Alberta, it does find restricted application as a household and garden spray. Chlordane levels in fish from the South Saskatchewan, Bow, Oldman and St. Mary River, while low, were still about 10 times higher than those recorded from rivers in central Alberta (AEC, 1983a, c). One might anticipate that this difference would reflect the past use of chlordane over large tracts of land; for example control of wireworms on potato crops in southern Alberta. However, no specific data are available for confirmation of this point.

Two major breakdown products of DDT are dichloroethenylidene chlorobenzene (DDE) and dichloroethylidene chlorobenzene (DDD). All three compounds are suspected carcinogens and have a long half life in tissues (>100 days) and high biconcentration factor (>50000). DDE is the most widely distributed pesticide-derived compound in fish in Alberta (AEC, 1983a, c). Residues found in fish from the South Saskatchewan, Oldman, Bow and St. Mary Rivers, while well below the safe consumption standard of 2.0 mg/kg, are among the highest found in Alberta. BHC (α) was formerly a contaminant of BHC mixtures. This latter agent has now been replaced with lindane consisting almost exclusively of γ-BHC. The γ-BHC isomer is highly specific in its action towards insects and shows low to moderate toxicity to mammals. BHC (α), on the other hand, is not a specific biocide and has high mammalian toxicity. It can be produced by isomeration of γ-BHC in sediments. The former use of tainted BHC mixtures is an other possible source, although the relatively short half life of this substances (<20 days) suggests that this is not an important route.

Overall, the level of PCB and pesticide contamination is the five rivers is low, reflecting the small industrial base and low rate of pesticide usage in Alberta. Residues in fish from this part of the province are comparable to those in central Alberta and are much lower than those reported for heavily industrialized parts of Canada, the USA, and Europe. Consequently there is no need for routine monitoring of residues in fish from the five rivers. However, some analysis should be conducted in approximately five years to ensure that levels are still low.

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APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Calgary
2. Below Bassano

RIVER/LAKE: Bow River

SPECIES: Brown Trout

- = less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	3/11/82	19.8	0.10	M																				0.002	0.270	0.033	3.22
1	3/11/82	18.9	0.09	M		-	-	0.001	-	-	-	0.002	0.256	-	0.138	-	-	-	-	-	-	-	-				
1	3/11/82	18.5	0.08	F																							
1	3/11/82	20.7	0.12	F																				0.002	0.209	0.030	3.47
1	3/11/82	20.8	0.13	F		-	-	-	-	-	-	0.002	0.208	0.001	0.090	-	-	-	-	-	-	-	-				
1	3/11/82	20.2	0.10	F																							
1	3/11/82	22.8	0.15	F																							
1	3/11/82	22.0	0.15	M																				0.001	0.200	0.016	3.24
1	3/11/82	21.6	0.14	M		-	-	-	-	-	-	0.001	0.220	-	0.111	-	-	-	-	-	-	-	-				
1	3/11/82	21.4	0.13	I																							
1	3/11/82	21.0	0.13	I																							
1	3/11/82	23.1	0.18	M																							
1	3/11/82	23.4	0.18	F																				0.003	0.167	0.054	2.31
1	3/11/82	24.3	0.18	F		-	-	-	-	-	-	0.004	0.151	0.002	0.069	-	-	-	-	-	-	-	-				
1	3/11/82	24.9	0.21	F																							
1	3/11/82	24.2	0.18	F																							
1	3/11/82	27.4	0.29	F																				0.002	0.226	0.034	3.28
1	3/11/82	26.7	0.22	M		-	-	0.005	-	-	-	0.003	0.235	0.001	0.111	-	-	-	-	-	-	-	-				
1	3/11/82	26.5	0.26	M																							
1	3/11/82	26.0	0.23	I																				0.005	0.163	0.077	1.83
1	3/11/82	37.6	0.73	F		-	-	0.001	0.011	-	-	0.010	0.303	0.002	-	-	-	-	-	-	-	-	-	0.107	0.265	0.138	6.81
1	3/11/82	50.7	1.58	M		-	-	-	0.006	-	-	0.016	0.088	0.003	-	-	-	-	-	-	-	-	-				

000021

SITE LEGEND

1. Calgary
2. Below Bassano

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

RIVER/LAKE: Bow River

SPECIES: Northern Pike

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	3/11/82	53.5	1.36	F			-		-		-	0.002	0.66		-		-		-		-		-	0.001	0.488	0.01	7.59
1	3/11/82	29.3	0.22	F			-		-		-	0.001	0.29		-		-		-		-		-	0.001	0.265	0.01	4.45
2	23/8/82	44.8	0.7	F		-	0.015	-	-	-	-	-	0.24	-	-	-	0.09	-	-	-	0.014	-	-	-	0.184	-	1.79
2	23/8/82	59.0	1.38	M		-	-	-	-	-	-	0.001	0.51	-	-	-	0.33	-	-	-	-	-	-	-	0.525	-	9.36
2	23/8/82	61.6	1.60	F		-	-	-	0.017	-	-	0.001	0.83	-	-	-	0.50	-	-	-	-	-	-	-	0.666	-	9.63

SPECIES:

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
2	23/8/82	44.7	1.4	F		-	0.023	-	0.027	-	-	-	0.200	-	-	-	0.097	-		-	0.032	-	-	-	0.221	-	2.57

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SITE LEGEND

1. Calgary

2. Below Bassano

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

RIVER/LAKE: Bow River

SPECIES: White Sucker

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	3/11/82	38.5	0.99	F		[	]	[	]	[	]	[	]	[	]	[	]	[	]	[	]	[	]	[	]	[	]
1	3/11/82	38.8	0.93	M			-		-		-	0.005	0.63		-		-		-				-	0.003	0.523	0.111	11.84
1	3/11/82	38.3	0.85	M																							
1	3/11/82	35.5	0.84	M		[	-	[	-	[	-	[	]	[	]	[	]	[	]	[	]	[	]	[	]	[	]
1	3/11/82	35.3	0.81	F								0.006	0.42		-		-		-		-		-	0.004	0.544	0.131	7.45
1	3/11/82	37.3	0.83	F		-	-	-	-	-	-	0.006	0.45	-	-	-	-	-	-	-	-	-	-	0.005	0.544	0.124	7.89
1	3/11/82	40.7	1.18	F		-	-	-	-	-	-	0.004	0.42	-	-	-	-	-	-	-	-	-	-	0.003	0.447	0.065	7.04
1	3/11/82	43.2	1.32	F		-	-	-	-	-	-	0.011	0.72	-	-	-	-	-	-	-	-	-	-	0.008	0.781	0.151	13.00
1	3/11/82	27.8	0.33	F		-		-		-		0.001		-		-		-		-		-		-		0.006	

Brackets refer to composite sample

020023

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Calgary
2. Below Bassano

RIVER/LAKE: Bow River

SPECIES: Rainbow Trout

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	3/11/82	18.9	0.10	F		-	-	-	-	-	-	0.003	0.134	0.001	-	-	-	-	-	-	-	-	-	-	0.136	0.03	1.95
1	3/11/82	20.3	0.12	M																							
1	3/11/82	22.0	0.15	M		-	-	-	-	-	-	0.004	0.324	0.002	-	-	-	-	-	-	-	-	-	-	0.172	0.04	4.93
1	3/11/82	26.5	0.31	M		-	-	-	-	-	-	0.005	0.193	0.002	-	-	-	-	-	-	-	-	-	-	0.201	0.05	2.72
1	3/11/82	27.0	0.28	M																							
1	3/11/82	33.1	0.49	M		-	-	-	-	-	-	0.004	0.501	0.001	-	-	-	-	-	-	-	-	-	-	0.518	0.04	7.53
1	3/11/82	37.4	0.72	F		-	-	-	-	-	-	0.006	0.090	0.001	-	-	-	-	-	-	-	-	-	-	0.219	0.03	3.07
1	3/11/82	37.9	0.88	M																							
1	3/11/82	39.4	0.78	F		-	-	-	0.025	-	-	0.009	0.533	-	-	-	-	-	-	-	-	-	-	-	0.424	0.19	6.75
1	3/11/82	39.0	0.92	M																							
1	3/11/82	40.2	1.06	F		-	-	-	0.042	-	-	0.015	0.764	-	-	-	-	-	-	-	-	-	-	-	0.523	0.35	8.40
1	3/11/82	41.4	0.92	F																							

SPECIES: Longnose Sucker

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	3/11/82	20.1	0.12	I		-	-	-	-	-	-	0.002	0.083	0.001	-	-	-	-	-	-	-	-	-	0.002	0.107	0.06	1.42
1	3/11/82	43.2	1.02	M		-	-	-	0.012	-	-	0.044	0.741	0.056	0.738	-	-	-	-	-	-	-	-	0.014	0.286	1.67	12.33
1	3/11/82	18.3	0.08	I		-	-	-	-	-	-	0.002	0.088	0.001	0.044	-	-	-	-	-	-	-	-	0.002	0.126	0.03	1.26
1	3/11/82	31.4	0.42	M		-	-	-	-	-	-	0.001	0.096	0.001	0.096	-	-	-	-	-	-	-	-	0.001	0.135	0.02	1.32

0000234

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Calgary
2. Below Bassano

RIVER/LAKE: Bow River

SPECIES: Mountain Whitefish

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		=BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	3/11/82	25.6	0.26	F		-	-	0.001	0.012	-	-	0.004	0.108	0.003	0.145	-	-	-	-	-	0.008	-	-	0.004	0.111	0.054	1.72
1	3/11/82	26.6	0.26	I																							
1	3/11/82	27.2	0.30	M																							
1	3/11/82	27.2	0.27	F		-	-	0.001	0.036	-	-	0.004	0.338	0.003	0.257	-	-	-	-	-	0.027	-	-	0.004	0.316	0.052	3.75
1	3/11/82	27.8	0.30	M																							
1	3/11/82	27.0	0.30	M																							
1	3/11/82	28.9	0.30	F																							
1	3/11/82	28.2	0.53	M																							
1	3/11/82	28.0	0.34	F		-		0.002	0.024	-	-	0.009	0.405	0.009	0.278		-		-	-	0.029	-	-	0.009	0.390	0.155	4.72
1	3/11/82	28.9	0.33	M																							
1	3/11/82	28.4	0.30	F																							
1	3/11/82	29.9	0.38	F																							
1	3/11/82	29.8	0.42	F		0.001		-	0.027	-	-	0.018	0.775	0.011	0.489	-	-	-	-	-	0.038	-	-	0.233	0.674	0.016	8.95
1	3/11/82	29.6	0.38	M																							
1	3/11/82	29.5	0.33	F																							
1	3/11/82	30.9	0.41	M																							
1	3/11/82	30.4	0.41	M																							
1	3/11/82	30.2	0.38	F																							
1	3/11/82	30.5	0.41	M		-	-	0.001	0.031	-	-	0.038	1.438	0.028	0.810	-	-	-	-	-	0.058	-	-	0.040	1.158	0.629	12.82
1	3/11/82	30.6	0.41	F																							
1	3/11/82	30.5	0.39	F																							
1	3/11/82	31.1	0.41	M																							
1	3/11/82	31.4	0.43	F																							
1	3/11/82	31.4	0.43	M		-	-	-	0.026	-	-	0.013	1.150	0.006	0.656	-	-	-	-	-	0.043	-	-	0.012	0.958	-	12.23
1	3/11/82	31.3	0.42	F																							
1	3/11/82	31.1	0.42	F																							
1	3/11/82	32.8	0.45	F																							

220000

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Calgary
2 Below Bassano

RIVER/LAKE:

SPECIES: Mountain Whitefish
continued

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	3/11/82	32.5	0.56	F		-	-	0.003	0.016	-	-	0.026	0.938	0.016	0.617	-	-	-	-	-	0.045	-	-	0.023	0.947	0.447	11.27
1	3/11/82	32.4	0.46	M																							
1	3/11/82	32.4	0.46	M																							
1	3/11/82	33.1	0.45	F																							
1	3/11/82	33.5	0.42	M		-	-	0.003	0.016	-	-	0.031	1.181	0.022	0.823	-	-	-	-	-	0.047	-	-	0.021	1.295	0.528	16.63
1	3/11/82	35.8	0.52	F																							
1	3/11/82	34.1	0.51	F		-	-	0.003	0.014	-	-	0.032	0.886	0.019	0.694	-	-	-	-	-	0.038	-	-	0.476	0.908	0.031	12.15
1	3/11/82	34.5	0.58	F																							
1	3/11/82	40.2	0.39	F		-	-	0.003	0.027	-	-	0.011	0.534	0.055	0.415	-	-	-	-	-	0.049	-	-	0.031	2.218	0.167	7.02
1	3/11/82	38.4	0.39	M																							

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Calgary
2. Below Bassano

RIVER/LAKE: Bow River

SPECIES: Mountain Whitefish

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
2	23/8/82	22.1	0.15	I		-	-	-	-	-	-	0.001	0.16	-	-	-	-	-	-	-	0.018	-	-	-	0.231	-	2.51
2	23/8/82	21.6	0.15	M								0.001															
2	23/8/82	26.6	0.31	M																							
2	23/8/82	27.2	0.32	F																		-		0.002	0.103	0.017	1.10
2	23/8/82	28.1	0.31	M								0.001	0.07	-		-		-		-							
2	23/8/82	28.2	0.38	F																							
2	23/8/82	28.3	0.42	M																							
2	23/8/82	28.6	0.41	M																							
2	23/8/82	28.8	0.43	F																							
2	23/8/82	28.8	0.38	F		0.001	-	-	-	-	-	0.001	0.11	-	-	-	-	-	-	-	0.013	-	-	0.002	0.159	0.018	1.56
2	23/8/82	28.4	0.38	F																							
2	23/8/82	28.5	0.40	F																							
2	23/8/82	28.5	0.40	M																							
2	23/8/82	30.1	0.46	M																							
2	23/8/82	30.0	0.48	F		0.001	0.028	-	-	-	-	0.002	0.14	-	-	-	-	-	-	0.001		-	-	0.003	0.213	0.031	2.51
2	23/8/82	31.8	0.50	M																							
2	23/8/82	33.6	0.70	F		-	-	-	-	-	-	0.001	0.17	-	-	-	-	-	-	-	-	-	-	0.001	0.197	0.014	3.13
2	23/8/82	34.9	0.88	F																							
2	23/8/82	29.8	0.42	F																							
2	23/8/82	29.8	0.46	F		-	0.026	-	-	-	-	0.001	0.103	-	-	-	-	-	-	-	-	-	-	-	0.139	-	1.61
2	23/8/82	29.6	0.42	F																							
2	23/8/82	36.2	0.92	F		-		-		-		0.004	0.24	-		0.002		-		0.001		-		0.004	0.237	0.057	3.99
2	23/8/82	40.3	1.05	F																							

420000

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Calgary
2. Below Bassano

RIVER/LAKE: Bow River

SPECIES: Lake Whitefish

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		•BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
2	25/11/82	35.2	0.62	F		-	0.023	-	-	-	-	-	0.029	-	-	-	-	-	-	-	-	-	-	-	0.046	-	0.51
2	25/11/82	35.2	0.58	M																							
2	25/11/82	37.3	0.72	M																							
2	25/11/82	37.2	0.66	M																							
2	25/11/82	37.7	0.74	M		-	0.012	-	-	-	-	-	0.131	-	-	-	-	-	-	-	-	-	-	-	0.116	-	1.67
2	25/11/82	38.5	0.78	M																							
2	25/11/82	37.7	0.66	M																							
2	25/11/82	37.1	0.76	F																							
2	25/11/82	39.1	0.72	F																							
2	25/11/82	39.5	0.84	M																							
2	25/11/82	39.5	0.80	M		-	0.025	-	-	-	-	-	0.041	-	-	-	-	-	-	-	0.012	-	-	-	0.068	-	0.66
2	25/11/82	40.1	0.92	M																							
2	25/11/82	40.1	0.72	F																							
2	25/11/82	40.6	0.74	M																							
2	25/11/82	40.9	0.66	M																							
2	25/11/82	40.8	0.81	F		-	0.009	-	-	-	-	-	0.113	-		-	0.055	-		-		-		-	0.107	-	1.45
2	25/11/82	40.4	0.90	M																							
2	25/11/82	40.2	0.82	F																							
2	25/11/82	40.2	0.81	F																							
2	25/11/82	41.5	1.10	F																							
2	25/11/82	41.4	0.90	M																							
2	25/11/82	41.4	0.85	F		-	0.031	-		-		-	0.059	-		-	0.028	-		-	0.009	-		-	0.083	-	0.09
2	25/11/82	41.4	0.94	F																							
2	25/11/82	42.1	0.88	M																							
2	25/11/82	42.0	1.03	F		-	0.021	-		-		-	0.114	-	-	-	0.033	-	-	-	0.008	-	-	-	0.092	-	1.86

83060

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Calgary
2. Below Bassano

RIVER/LAKE: Bow River

SPECIES: Walleye

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		⍺-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
2	23/8/82	34.7	0.50	M		-	0.011	-	0.020	-	-	-	0.255	-	-	-	0.108	-	-	-	0.032	-	-	-	0.258	-	2.94
2	23/8/82	34.6	0.52	M																							
2	23/8/82	36.7	0.62	F		-	0.021	-	0.007	-	-	-	0.205	-	-	-	0.128	-	-	-	0.034	-	-	-	0.327	-	3.06
2	23/8/82	36.9	0.70	M																							
2	23/8/82	37.3	0.59	M		-	0.020	-	0.008	-	-	-	0.268	-	-	-	0.113	-	-	-	0.037	-	-	-	0.338	-	3.39
2	23/8/82	37.5	0.60	M																							
2	23/8/82	39.2	0.70	F		-	0.021	-	0.013	-	-	-	0.28	-	-	-	0.144	-	-	-	0.037	-	-	-	0.325	-	3.27
2	23/8/82	38.9	0.73	M																							
2	23/8/82	40.3	0.73	F		-	0.021	-	0.009	-	-	0.001	0.35	-	-	-	0.15	-	-	-	0.040	-	-	-	0.388	-	3.10
2	23/8/82	40.0	0.76	M																							
2	23/8/82	45.2	1.28	M																							
2	23/8/82	45.0	1.20	F																							
2	23/8/82	46.0	1.24	F		-	-	-	-	-	-	0.001	1.41	-	-	-	0.28	-	-	-	0.045	-	-	-	0.781	-	18.79
2	23/8/82	51.3	1.60	M																							
2	23/8/82	62.1	3.2	F																							
2	23/8/82	60.5	2.94	F		-	0.054	-	-	-	-	-	1.53	-	-	-	0.34	-	-	-	0.052	-	-	-	0.975	-	14.46

620029

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Calgary
2. Below Bassano

RIVER/LAKE: Bow River

SPECIES: Ling

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
2	23/8/82	76.5	3.44	F		-	ND	-	ND	-	ND	-	0.76	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND
2	23/8/82	79.0	3.2	F		-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND
2	23/8/82	48.9	0.70	F		-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND
2	23/8/82	39.2	0.44	F		-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND
2	23/8/82	36.7	0.24	F		-	ND	-	ND	-	ND	0.003	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND
2	23/8/82	84.1	3.34	F		-	ND	-	ND	-	ND	0.001	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Rattlesnake Hole

RIVER/LAKE: South Saskatchewan Rive

SPECIES: Sauger

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	25/08/82	25.1	0.18	M		-	-	-	-	-	-	-	0.199	-	-	-	-	-	0.048	-	0.030	-	-	-	0.419	-	2.53
1	25/08/82	30.1	0.30	M																							
1	25/08/82	31.1	0.28	M		-	-	-	-	-	-	-	0.204	-	-	-	-	-	0.041	-	0.027	-	-	-	0.461	-	3.44
1	25/08/82	30.7	0.34	M																							
1	25/08/82	34.5	0.42	F		-	-	-	-	-	-	0.001	0.285	-	-	-	-	-	0.041	-	0.026	-	-	0.001	0.635	0.009	5.50
1	25/08/82	34.5	0.42	M																							
1	25/08/82	36.4	0.56	M		-	-	-	-	-	-	0.001	0.318	-	-	-	-	-	0.044	-	0.027	-	-	-	0.593	-	6.28
1	25/08/82	35.2	0.48	M																							
1	25/08/82	39.1	0.64	F		-	-	-	-	-	-	0.001	0.217	-	-	-	-	-	0.039	-	0.026	-	-	0.001	0.409	-	3.57
1	25/08/82	39.2	0.64	F																							
1	25/08/82	41.3	0.78	F		-	-	-	-	-	-	-	0.147	-	-	-	-	-	0.039	-	0.023	-	-	-	0.270	-	2.82
1	25/08/82	41.6	0.96	F																							
1	22/08/80	44.3	0.88		6	-	-	0.002		0.001		0.001		-		-		-		-		-		0.002		0.026	
1	22/08/80	37.6	0.49		7	-	0.013	-	0.115	-		0.001		-		-	0.057	-	0.033	-	0.042	-	0.009	-	0.365	0.004	2.34
1	22/08/80	42.6	0.81		8	-	0.021	-	0.126	-		0.001		-		-	0.096	-	0.036	-	0.063	-	0.030	-	0.249	0.011	4.03
1	22/08/80	36.8	0.52		3	-	0.019	0.002	0.134	0.001		0.002		-		-	0.070	-	0.036	-	0.056	-	0.027	0.001	0.365	0.016	2.67
1	22/08/80	39.6	0.61		5	-	0.019	0.002	0.099	0.001		0.002		-		0.001	0.059	0.001	0.031	0.001	0.052	0.001	0.022	0.001	0.511	0.036	3.38
1	22/08/80	37.6	0.51		5	-	0.021	0.001	0.148	-		0.001		-		-	0.052	-	0.030	-	0.053	-	0.020	0.001	0.428	0.007	2.89
1	22/08/80	33.7	0.37		6	-	0.018	-	0.109	-		0.003		-		-	0.074	-	0.036	-	0.061	-	0.027	0.002	0.386	0.008	3.08
1	22/08/80	39.0	0.58		7	-	0.019	0.007	0.117	-		0.050		-		-	0.089	-	0.027	-	0.034	-	0.023	0.005	0.370	0.016	17.6
1	22/08/80	40.8	0.83		6	-	0.012	0.002	0.072	0.001		0.020		-		-	0.032	-	0.025	-	0.038	-	0.006	0.002	0.343	0.036	3.57

000031

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Rattlesnake Hole

RIVER/LAKE: South Saskatchewan River

SPECIES: Northern Pike

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	25/08/82	53.0	1.04			-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-		-	-
1	25/08/82	51.6	1.34			-	0.020	-	-	-	-	-	0.069	-	-	-	-	-	-	-		-	-	-		-	-
1	22/07/80	51.8	0.91		4	-	0.020	-	0.088	-		-	0.202	-		-	0.113	-	0.018	-	0.036	-	0.023	-	0.057	0.007	9.45
1	22/7/80	54.8	1.23		3	-	0.027	-	0.142	-		-		-		-	0.074	-	0.031	-	0.052	-	0.016	-	0.127	-	1.74

Sturgeon

1	25/08/82	84.5	5.03	M		0.001	0.018	-		-		0.002	0.077	-		-		-		-		-		0.003	0.115	0.046	1.10
1	25/08/82	78.6	2.50	M		0.001		-		-		0.002		-		-		-		-		-		0.003		0.046	

SPECIES: ∝ [illegible]

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	22/08/80	38.6	0.66		3	-	0.020	0.003	0.146	0.001		0.002	0.264	-		-	0.042	0.001	0.032	0.001	0.049	-	0.006	0.001	0.321	0.020	1.50
1	22/08/80	48.6	1.20		4	-	0.017	-	0.117	-		0.001	0.218	-		-	0.051	-	0.025	-	0.046	-	0.015	0.006	0.201	0.009	2.85
1	22/08/80	45.1	0.98		4			0.001		0.001		0.001				0.001		-						0.001		0.011	

23000

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Rattlesnake Hole

RIVER/LAKE: South Saskatchewan River

SPECIES: Goldeye

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	22/08/80	25.0	0.19	M	3	0.001	0.013	0.009	0.118			0.006	0.091	-		0.002	-	0.001	-	0.001	-	0.002	0.016	0.003	0.052	0.038	0.59
1	22/08/80	29.0	0.31		6		0.009		0.105				0.240				0.036		0.010		0.022		0.019		0.089		1.95
1	22/08/80	40.0	0.75	M	9	0.001	0.010	0.008	0.120	0.002		0.003	0.097	-		-	0.037	-	0.018	-	0.026	-	-	0.006	0.063	0.032	1.10
1	22/08/80	40.2	0.72		9	0.001	0.003	0.012	0.053	0.003		0.005	0.051	-		-	-	0.001	0.013	0.001	0.016	0.001	0.010	0.003	0.058	0.057	0.51
1	22/08/80	40.2	0.77			0.001	0.010	0.010	0.086	0.003		0.010	0.121	-		-	0.031	0.001	0.017	0.002	0.028	0.002	0.024	0.007	0.047	0.094	1.07
1	22/08/80	31.1	0.37	M	8	-		0.003		0.001		0.002		-		-		-		-		-		0.002		0.009	
1	22/08/80	29.1	0.35	M	9	0.001		0.007		0.002		0.009		-		0.002		0.001	0.003	-		0.001		0.008		0.047	
1	22/08/80	36.9	0.62	F	7	0.002	0.019	0.011	0.083	0.004		0.056	0.655	-		0.008	0.050	0.011	0.017	0.001	0.011	0.002	0.021	0.031	0.017	0.302	3.63
1	22/08/80	39.8	0.74		9	0.001	0.028	0.011	0.160	0.002		0.011	0.360	-		0.005	0.169	0.001		0.002	0.040	0.001	0.046	0.010	0.152	0.036	2.30
1	22/08/80	29.6	0.36		8	-		0.001		-		0.014		-		-		-		-		-		0.003		0.095	
1	22/08/80	29.1	0.33	M	7	-	0.008	0.003	0.041	0.001		0.005	0.110	-		-	0.017	-	0.010	0.001	0.016	-	0.008	0.002	0.054	0.010	1.13
1	22/08/80	32.2	0.68			0.001	0.023	0.005	0.109	0.031		0.100	1.79	-		0.073	0.126	0.004	-	0.010	0.013	0.007	0.006	0.009	-	0.072	8.49
1	22/08/80	28.4	0.32	M	7	0.001	0.009	0.008	0.111	0.002		0.102	0.208	-		0.002	0.012	-	0.008	0.001	0.012	0.001	0.012	0.006	0.098	0.006	1.54
1	22/08/80	28.5	0.33		7	-	0.004	0.005	0.046	0.002		0.042	0.155	-		0.001	-	-	-	0.001	-	-	0.007	0.002	0.049	0.036	1.05
1	22/08/80	30.2	0.36		9	-	0.011	0.003	0.103	0.001		0.006	0.021	-		-	0.062	-	0.014	-	0.028	-	0.033	0.005	0.101	0.028	2.04
1	22/08/80	31.7	0.43		8	0.001		0.005		0.002		0.012		-		-		-		-		-		0.002		0.011	
1	22/08/80	38.0	0.57	M	10	0.001	0.007	0.006	0.073	0.003		0.019	0.115	-		0.003	0.016	0.001	0.016	0.001	0.022	0.001	0.028	0.004	0.046	0.009	1.71
1	22/08/80	37.6	0.49			-		0.001		-		0.002		-		-		-		-		-		-		0.012	
1	22/08/80	29.6	0.38			-	0.006	0.003	0.94	0.001		0.025	0.58	-		-	0.040	-	0.014	-	0.023	-	0.021	-	-	0.142	0.71

000033

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Rattlesnake Hole

RIVER/LAKE: South Saskatchewan River

SPECIES: Longnose Sucker

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	22/07/80	42.6	0.97		4	0.003	-	0.015	-	0.004		0.038	-	-		-	-	0.001	-	0.004	-	-	-	0.047	-	0.240	-

Northern Redhorse

1	22/07/80	38.5	0.80		6	0.001	0.019	0.005	0.132	0.001		0.067	1.17	-		0.020	0.326	0.001	0.019	-	0.048	0.002	0.045	0.029	0.659	0.45	12.25
1	22/07/80	40.6	1.14		8	0.001	0.013	0.006	0.122	0.001		0.013	0.254	-		0.003	0.030	0.001	0.015	0.001	0.019	0.001	0.030	0.007	0.233	0.01	2.47

Lake Whitefish

1	22/07/80	42.0	0.85		4	-		0.001				0.002		-		-		-		-		-		0.001		0.024	

000034

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Confluence of Crowsnest and Oldman River

RIVER/LAKE: Crowsnest/Oldman River

SPECIES: Rocky Mountain Whitefish

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		⍺BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	25/08/82	15.6	0.06	I																							
1	25/08/82	16.6	0.07	I		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	16.5	0.07	I																							
1	25/08/82	16.0	0.06	I																							
1	25/08/82	17.1	0.08	I																							
1	25/08/82	17.6	0.08	I		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	19.4	0.11	F																							
1	25/08/82	20.3	0.13	F																							
1	25/08/82	21.2	0.16	M		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	21.2	0.17	M																							
1	25/08/82	21.3	0.15	M		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	22.0	0.16	M																							
1	25/08/82	23.1	0.21	M																							
1	25/08/82	24.9	0.28	F																							
1	25/08/82	25.9	0.26	F		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	25.8	0.26	M																							
1	25/08/82	26.3	0.28	M																							
1	25/08/82	26.2	0.22	F																							
1	25/08/82	30.6	0.42	M																							
1	25/08/82	28.5	0.39	F		-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	28.4	0.35	F																							
1	25/08/82	29.5	0.39	F																							
1	25/08/82	27.9	0.31	F																							
1	25/08/82	31.8	0.48	F																							
1	25/08/82	31.3	0.50	F		-	-	-	-	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	32.2	0.38	F																							
1	25/08/82	36.7	0.79	F																							
1	25/08/82	35.6	0.60	F		-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-

000035

SITE LEGEND

1. Confluence of Crowsnest and Oldman River

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

RIVER/LAKE: Crowsnest/Oldman River

SPECIES: Rainbow Trout

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	25/08/82	17.9	0.1	F																							
1	25/08/82	17.4	0.09	F			-		-		-		0.001		-		-		-		-		-		-		-
1	25/08/82	15.1	0.06	M																							
1	25/08/82	18.3	0.10	M																							
1	25/08/82	18.2	0.10	F																							
1	25/08/82	18.9	0.10	F		-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	19.8	0.13	I																							
1	25/08/82	19.7	0.14	M																							
1	25/08/82	20.5	0.20	F																							
1	25/08/82	20.4	0.17	I																							
1	25/08/82	20.3	0.13	M		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	20.3	0.11	M																							
1	25/08/82	21.5	0.16	M																							
1	25/08/82	24.7	0.21	F																							
1	25/08/82	24.6	0.23	F		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	23.0	0.18	M																							
1	25/08/82	26.1	0.28	F																							
1	25/08/82	26.6	0.30	M		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	27.5	0.30	M																							
1	25/08/82	28.1	0.39	F																							
1	25/08/82	29.9	0.45	F																							
1	25/08/82	29.1	0.35	F		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08/82	30.5	0.44	F																							
1	25/08/82	31.7	0.48	M																							

SITE LEGEND

1. Confluence of Crowsnest and Oldman River

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

RIVER/LAKE: Crowsnest/Oldman River

SPECIES: Brown Trout

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB muscle	HCB fat	∝BHC muscle	∝BHC fat	LINDANE muscle	LINDANE fat	DDE muscle	DDE fat	DDT muscle	DDT fat	DDD muscle	DDD fat	HEPTACHLOR EPOXIDE muscle	HEPTACHLOR EPOXIDE fat	DIELDRIN muscle	DIELDRIN fat	OXYCHLORDANE muscle	OXYCHLORDANE fat	CHLORDANE muscle	CHLORDANE fat	PCB muscle	PCB fat
1	25/08/82	20.7	0.13	M		-	-	0.001	-	-	-	-	-	-	-	-	-	0.003	-	-	-	-	-	-	-	-	-
Ling																											
1	25/08/82	43.4	0.65	F		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	25/08.82	45.6	0.60	F		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dolly Varden																											
1	25/08/82	24.8	0.19	F		0.001	-	0.001	-	-	-	0.002	-	-	-	-	-	-	0.002	-	-	-	-	0.001	-	0.017	-

000037

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND
1. Near Lethbridge

RIVER/LAKE: Oldman River

SPECIES: Sauger

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	1/8/80	32.6	0.32		3		0.030		0.138				0.636				0.069		0.057		0.087		0.005		0.706		0.54
1	1/8/80	33.9	0.39		3		0.025		0.130				0.692				0.026		0.048		0.059		0.005		0.517		5.99
1	1/8/80	25.8	0.16		2		0.013		0.096				0.182				0.038		0.038		0.032		-		0.272		2.30
1	1/8/80	34.8	0.42		4		0.017		0.104				0.380				0.063		0.040		0.054		-		0.490		6.72
1	1/8/80	34.2	0.41		5		0.012		0.091				0.410				0.003		0.032		0.040		-		0.491		3.40
1	1/8/80	33.6	0.44		3	0.001	0.020	0.003	0.069	-		0.003	0.215	-		-	0.088	0.001	0.032	0.001	0.040	-	-	0.005	0.479	0.049	3.55
1	1/8/80	40.4	0.61		7	0.001	0.036	0.004	0.107	0.001		0.057	1.16	-		-	0.025	-	0.023	-	0.046	-	0.005	0.034	0.817	0.28	20.03
1	1/8/80	31.6	0.36			-	0.019	0.002	0.104	-		0.004	0.121	-		-	-	-	0.016	-	0.024	-	-	0.004	0.200	0.030	2.66
1	1/8/80	37.0	0.56		4	-	0.015	0.001	0.109	-		0.001	0.338	-		-	0.049	-	0.051	-	0.051	-	-	0.001	0.363	-	2.24
1	1/8/80	41.2	0.48		8	0.001	0.048	0.002	0.106	-		0.002	0.318	-		-	0.029	-	0.050	0.001	0.072	-	0.007	0.001	0.622	0.016	5.13
1	1/8/80	34.6	0.42		3	-	0.015	0.001	0.124	-		-	0.290	-		-	0.007	-	0.045	-	0.087	-	-	-	0.269	-	2.13
1	1/8/80	38.8	0.55		5	-	0.014	-	0.033	-		0.001	0.097	-		-	0.040	-	0.007	-	0.023	-	-	-	0.333	0.032	6.00
1	1/8/80	35.2	0.48			-	0.014	0.001	0.059	0.001		0.001	0.265	-		-	0.035	-	0.032	-	0.038	-	-	0.001	0.302	0.017	3.34
1	1/8/80	36.4	0.46		4	-	0.015	0.001	0.149	-		0.002	0.149	-		-	0.044	-	0.042	-	0.099	-	-	0.002	0.188	0.012	2.13
1	1/8/80	31.6	0.52		3	-	0.012	0.001	0.072	-		0.002	0.576	-		-	-	-	0.018	-	0.026	-	-	0.002	0.973	0.042	5.49
1	1/8/80	35.0	0.40		4	-	0.006	-	0.037	-		0.001	0.216	-		-	-	-	0.004	-	0.006	-	-	0.002	0.212	0.027	4.31
1	1/8/80	36.5	0.40		5	-	-	0.001	-	-		0.001	-	-		-		-	-	-	-	-	-	0.001	-	0.037	-
1	1/8/80	39.5	0.54			-	-	-	-	-		0.029		-		-	0.041	-		-		-	-	0.001	-	-.217	
1	1/8/80	30.7	0.32		4	-	0.024	0.001	0.111	-		0.003	0.355	-		-	0.054	-	0.032	-	0.047	-	-	0.004	0.385	0.015	4.93
1	1/8/80	45.3	0.92		7	-	0.029	0.001	0.125	-		0.001	0.213	-		-	-	-	0.038	-	0.056	-	-	0.003	0.437	0.011	4.20
1	1/8/80	42.0	0.85			-	0.013	0.002	0.090	-		0.002	0.224	-		-	-	-	0.020	-	0.023	-	-	0.001	0.278	0.013	1.29
1	1/8/80	35.2	0.44		4	0.001	0.018	0.001	0.123	-		0.001	0.097	-		-	-	-	0.038	-	0.047	-	-	-	0.176	-	0.71
	27/7/82	47.7	1.10	F		-		-				0.001	0.143	-		-		-		-		-		0.001	0.277	0.018	4.60
	27/7/82	45.7	0.82	F				-				-	0.192	-		-		-		-		-		-	0.515		4.99
	27/7/82	44.0	0.84	F			0.230	-				0.001	0.408	-		-		-		-		-		0.002	0.946	0.017	14.53
	27/7/82	29.8	0.30	F			0.150	-				0.001	0.186	-		-		-		-		-		0.001	0.277	0.017	4.33
	27/7/82	38.2	0.61	F			0.200	0.001				0.001	0.172	-		-		-		-		-		0.002	0.350	0.023	4.99
	27/7/82	34.3	0.52	M		-	-	0.001	-	-	-	0.001	0.199	-	-	-	-	-	-	-	-	-	-	0.001	0.439	0.018	7.13

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

- is less than 0.0005 mg/kg (ppm)

SITE LEGEND

1. Near Lethbridge

RIVER/LAKE: Oldman River

SPECIES: Walleye

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	01/08/80	38.5	0.66		3	-	0.015	0.001	0.096	0.001		0.002	0.363	-		-	0.021	-	0.032	-	0.051	-	-	0.002	0.414	0.016	4.15
1	01/08/80	36.3	0.56		3	-	0.019	0.002	0.114	0.001		0.005	0.416	-		-	0.025	-	0.045	-	0.062	-	-	0.004	0.408		3.91
1	01/08/80	36.0	0.50		3	-	0.022	0.001	0.103	-		0.002	0.205	-		-	0.027	-	0.029	-	0.032	-	-	0.001	0.324		2.41
1	01/08/80	44.5	0.96				0.020		0.109				0.159				-		0.045		0.142	-	-		0.234		9.07
1	01/08/80	27.5	0.22		1		0.023		0.154				0.152				0.044		0.046		0.047		0.006		0.262		2.72
1	01/08/80	26.5	0.19		1		0.008		0.097				0.328				0.104		0.052		0.078		0.033		0.549		1.77
1	31/08/82	39.1	0.71	M		-	-	-	-	-	-	-	0.110	-	-	-	-	-	-	-	-	-	-	-	0.186	-	3.27
1	31/08/82	40.3	0.80	F		-	-	-	-	-	-	-	0.110	-	-	-	-	-	-	-	-	-	-	-	0.186	-	3.27
1	31/08/82	43.8	0.96	M		-	-	-	-	-	-	-	0.084	-	-	-	-	-	-	-	-	-	-	-	0.111	0.033	2.19
1	31/08/82	49.5	1.32	F		-	-	-	-	-	-	-	0.083	-	-	-	-	-	-	-	-	-	-	-	0.177	-	3.32

SPECIES: White Sucker

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	28/07/82	29.9	0.40	F		-	-	-	-	-	-	-	0.059	-	-	-	-	-	0.027	-	0.011	-	-	-	0.165	-	0.57
1	28/07/82	28.9	0.38	F		-	-	-	-	-	-	-	0.094	-	-	-	-	-	0.021	-	-	-	-	-	0.261	-	0.98
1	28/07/82	34.7	0.48	M		-	-	-	-	-	-	-	0.049	-	-	-	-	-	-	-	-	-	-	-	0.144	-	0.55
1	28/07/82	33.8	0.58	M		-	-	0.001	-	-	-	-	0.023	-	-	-	-	-	-	-	-	-	-	-	0.057	-	0.46
1	28/07/82	35.0	0.62	F		-	-	0.001	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-		-	
1	28/07/82	35.6	0.63	F		-		-		-		-		-		-		-		-		-		0.001		-	
1	28/07/82	37.0	0.71	F		-		0.001		-		-		-		-		-		-		-		-		-	
1	28/07/82	33.3	0.44	M		-		-		-		0.001		-		-		-		-		-					
1	28/07/82	35.3	0.51	M		-		0.001		-																	

000039

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

- is less than 0.0005 mg/kg (ppm)

SITE LEGEND

1. Near Lethbridge

RIVER/LAKE: Oldman River

SPECIES: Northern Pike

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	01/08/80	49.0	1.03		3	-	0.016	-	0.151	-	-	-	0.460	-	-	-	0.041	-	0.014	-	0.019	-	-	-	0.569	-	-
1	01/08/80	40.0	0.48		3	-	0.015	-	0.083	-	-	0.001	0.330	-	-	-	0.057	-	0.028	-	0.031	-	-	-	0.389	-	2.22
1	01/08/80	35.2	0.44			-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	01/08/80	45.5	0.74		3	-	0.021	-	0.106	-	-		0.452	-	-	-	0.061	-	0.034	-	0.037	-	-	-	0.549	-	2.52
1	28/07/82	48.5	0.93	M		-	0.200	-	-	0.001	-	-	0.234	-	-	-	-	-	-	-	-	-	-	0.001	0.465	0.017	4.84
1	28/07/82	41.5	0.61	M		-	0.004	-	-	-	-	0.001	0.432	-	-	-	-	0.001	0.014	-	0.007	-	-	-	0.450	-	4.57
1	19/08/82	52.6	1.44	M		-	0.008	-	0.012	-	-	0.001	0.223	-	-	-	0.043	-	0.011	-	-	-	-	-	0.303	-	3.24
1	19/08/82	39.0	0.68	M																							
1	19/08/82	39.1	0.75	M		-	-	0.001	0.008	-	-	0.001	0.151	-	-	-	-	-	0.009	-	0.014	-	-	0.002	0.200	0.019	2.76
1	19/08/82	38.7	0.65	M																							
1	19/08/82	44.2	0.85	F		-	-	0.001	-	-	-	0.001	0.228	-	-	-	-	0.001	-	-	-	-	-	0.003	0.403	0.037	4.67
1	19/08/82	49.0	1.59	F																							
1	19/08/82	48.7	1.32	F		-	-	0.001	-	-	-	-	0.168	-	-	-	-	0.001	0.011	-	0.017	-	-	-	0.340	0.013	4.56
1	19/08/82	46.7	0.96	M		-	-	-	-	-		-	0.224	-	-	-	-	-	-	-	-	-	-	-	0.41		7.63
1	19/08/82	49.7	0.98	F		-	-	-	-	-		-	0.224	-	-	-	-	-	-	-	-	-	-	-			
1	19/08/82	56.9	1.37	M		-	-	-	-	-	-	-	0.333	-	-	-	0.217	-	-	-	0.027	-	-	-	0.589	-	12.39

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APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1 Near Lethbridge

RIVER/LAKE: Oldman River

SPECIES: Sauger

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	01/08/80	34.0	0.54																								
1	01/08/80	35.1	0.54			-		0.001		-		-		-		-		-		-		-		-		-	
1	01/08/80	35.5	0.6																								
1	01/08/80	35.7	0.6																								
1	01/08/80	35.7	0.57			-		0.001		-		0.001		-		-		-		-		-		-		-	
1	01/08/80	35.6	0.59																								
1	01/08/80	37.5	0.80															0.002		-		-		-		-	
1	01/08/80	38.6	0.76			-		0.001		-		-		-		-											

000041

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1 Near Lethbridge

RIVER/LAKE: Oldman River

SPECIES: Northern Redhorse

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	28/07/82	32.6	0.54	M		-	-	-	-	-	-	-	0.031	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	28/07/82	32.8	0.60	M																							
1	28/07/82	33.7	0.64	F		-	-	-	-	-	-	-	0.056	-	-	-	-	-	-	-	-	-	-	-	-	-	0.617
1	28/07/82	35.4	0.52	F		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	28/07/82	36.4	0.72	F		-	-	-	-	-	-	0.001	0.081	-	-	-	-	-	0.021	-	0.009	-	-	-	0.130	0.014	1.33
1	28/07/82	36.8	0.65	F																							
1	28/07/82	38.7	0.94	M		-	-	-	-	-	-	-	0.071	-	-	-	-	-	0.018	-	-	-	-	-	0.200	-	2.25
1	28/07/82	37.3	0.88	F		-	-	0.001	0.012	-	-	0.001	0.058	-	-	-	-	-	-	-	-	-	-	0.001	0.137	0.013	1.67

Rocky Mountain Whitefish

1	31/08/82	33.5	0.70	M		-	-	0.001	0.005	-	-	0.003	0.087	-	-	-	-	-	-	-	-	-	-	0.006	0.137	0.075	2.68
1	31/08/82	32.6	0.58	M																							
1	31/08/82	30.8	0.50	F		-	-	0.001	0.005	-	-	0.004	0.058	-	-	-	-	-	-	-	-	-	-	0.007	0.201	0.073	1.87
1	31/08/82	21.5	0.11	F		-	-	0.001	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	0.001		0.009	-
1	31/08/82	33.5	0.64	M		-	-	0.006	0.009	-	-	0.005	0.152	-	-	-	-	-	0.011	-	0.152	-	-	0.009	0.300	0.11	4.12
1	31/08/82	35.0	0.64	F		-	-	-	0.009	-	-	0.005	0.048	-	-	-	-	-	0.009	0.001	-	-	-	0.014	0.113	0.17	3.33
1	31/08/82	27.4	0.30	F																							
1	31/08/82	26.9	0.27	M		-	-	0.001	-	-	-	0.001	0.053	-	-	-	-	-	-	-	-	-	-	0.002		0.030	
1	31/08/82	33.2	0.56	F																							
1	31/08/82	33.3	0.58	M		-	-	-	-	-	-	0.003	0.120	-	-	-	-	-	-	-	-	-	-	0.004	0.246	0.063	4.68
1	31/08/82	32.6	0.52	F																							
1	31/08/82	34.6	0.63	M		-	-	0.003	-	-	-	0.004	0.143	-	-	-	-	-	-	0.001	-	-	-	0.009	0.491	0.129	11.51
1	31/08/82	38.4	0.92	M		-	-	0.006	-	-	-	0.004	0.094	-	-	-	-	-	-	0.002	-	-	-	0.010	0.337	0.156	5.62

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APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Near Lethbridge

RIVER/LAKE: Oldman

SPECIES: Goldeye

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	19/8/82	22.8	0.17	F																							
1	19/8/82	22.4	0.16	F		-	-	-	-	-	-	-	0.021	-	-	-	-	-	-	-	-	-	-	0.050	-	1.42
1	19/8/82	22.1	0.15	M																							
1	19/8/82	23.0	0.17	M																							
1	19/8/82	23.9	0.22	F		-	-	0.001	-	-	-		0.060		-		-		-		-		-	0.060		1.65
1	19/8/82	23.0	0.18	F																							
1	19/8/82	24.1	0.20	F		-	-	-	-	-	-		0.096		-		-		-		-		-	0.065		-	
1	19/8/82	24.7	0.23	F																							
1	19/8/82	25.0	0.24	M		-	-	-	-	-	-		0.057		-		-		-		-		-	-		1.75	
1	19/7/80	32.9	0.50		6	-	0.013	-	0.070	-		-	0.021	-		-	-	-	0.020	-	0.029	-	-	-	0.023	-	0.08	
1	27/7/82	20.8	0.11	I		-	-	0.001	0.006	-	-	0.001	0.048	-	-	-	-	-	-	-	-	-	-	-	0.034	-	0.5	
1	27/7/82	20.6	0.12	I																							
1	27/7/82	22.0	0.13	I																							
1	27/7/82	22.1	0.14	M		-	-	0.001	-	-	-	-	0.035	-	0.309	-	-	-	-	-	-	-	-	-	0.030	-	0.47	
1	27/7/82	22.0	0.13	I																							
1	27/7/82	22.5	0.16	M																							
1	27/7/82	22.6	0.14	M		-	-	-	0.009	-	-	0.001	0.026	-	-	-	-	-	-	-	-	-	-	-	0.04	-	0.70	
1	27/7/82	23.5	0.48	M																							

000043

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Near Lethbridge

RIVER/LAKE: Oldman River

SPECIES: Longnose Sucker

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	28/07/82	34.6	0.49	M		0.001	-	-	-	-	-	0.002	0.102	0.002	0.084	-	-	-	-	-	-	-	-	0.003	-	0.018	-
1	28/07/82	35.4	0.49	M																							
1	28/07/82	38.8	0.71	M		-	-	0.001	-	-	-	0.004	0.036	-	-	-	-	-	-	-	-		-	0.006	-	0.085	0.643
1	28/07/82	37.2	0.60	M																							
1	28/07/82	29.1	0.60	M		-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-		-	0.004	-	0.042	-
1	28/07/82	36.1	0.50	M		-	-	0.003	-	-	-	0.003	-	-		-		-	-	-	-			0.005		0.076	-
1	28/07/82	39.6	0.62	M		-	-	0.001	-	-	-	0.001	-	-		-		-	-	-	-			0.001		0.016	-
1	28/07/82	37.8	0.64	M																							
1	28/07/82	38.5	0.62			-		0.002		-		0.001		-		-		-		-		-		0.002		0.021	-
1	28/07/82	38.2	0.65	F																							
1	28/07/82	34.0	0.54	M																							
1	28/07/82	35.1	0.54	M			-		0.006		-		0.032		-		-		-		-		-		0.033		0.295
1	28/07/82	35.5	0.60	M																							
1	28/07/82	35.7	0.60	F																							
1	28/07/82	35.7	0.57				-		0.008		-		0.074		0.078		-		-		-		-		-		-
1	28/07/82	35.6	0.59	M																							
1	28/07/82	37.5	0.80	M			-		0.006				0.022		0.078		-		-		-		-		-		-
1	28/07/82	38.6	0.76	M																							

0001 44

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

SITE LEGEND

1. Confluence of St. Mary and Crowsnest River
2. Below St. Mary Reservoir

RIVER/LAKE: St. Mary's River

SPECIES: Northern Pike

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB muscle	HCB fat	∝BHC muscle	∝BHC fat	LINDANE muscle	LINDANE fat	DDE muscle	DDE fat	DDT muscle	DDT fat	DDD muscle	DDD fat	HEPTACHLOR EPOXIDE muscle	HEPTACHLOR EPOXIDE fat	DIELDRIN muscle	DIELDRIN fat	OXYCHLORDANE muscle	OXYCHLORDANE fat	CHLORDANE muscle	CHLORDANE fat	PCB muscle	PCB fat
1	07/08/80	70.6	3.00		5	-	0.022	0.01	0.132	-	-	0.006	0.244	-	-	-	-	-	0.033	-	0.033	-	-	0.005	0.274	0.034	4.70
1	07/08/80	52.5	1.37			-	-	-	-	-	-	-	0.4[illegible]		-		-	-		-		-	-		-	-	-

White Sucker

1	07/08/80	24.0	0.50			-		0.003		0.001		0.002		-		-		-		0.001		-		-		0.007	

Rocky Mountain Whitefish

1	07/80/80	28.6	0.35				-		-		-		-		-		-		-		-		-		-		-

Northern Redhorse

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB muscle	HCB fat	∝BHC muscle	∝BHC fat	LINDANE muscle	LINDANE fat	DDE muscle	DDE fat	DDT muscle	DDT fat	DDD muscle	DDD fat	HEPTACHLOR EPOXIDE muscle	HEPTACHLOR EPOXIDE fat	DIELDRIN muscle	DIELDRIN fat	OXYCHLORDANE muscle	OXYCHLORDANE fat	CHLORDANE muscle	CHLORDANE fat	PCB muscle	PCB fat
1	07/08/80	35.9	0.62		7	0.001		0.003		0.001		0.001		-		-		0.001		0.001		-		0.002		-	

0000045

SITE LEGEND

1. Confluence of St. Mary and Oldman River

2. Below St. Mary Reservoir

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

RIVER/LAKE: St. Mary River

SPECIES: Walleye

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		∝BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
1	08/08/80	40.0	0.64		3	-	0.023	0.001	0.121	-		0.002	0.363	-		-	-	-	0.019	-	0.030	-	-	0.001	0.325	0.034	6.18
1	08/08/80	40.4	0.82		3	-	0.023	0.002	0.136	-		0.002	0.183	-		-	0.027	-	0.041	-	0.056	-	-	0.003	0.285	0.021	2.48
1	08/08/80	39.9	0.70		4	-	0.028	0.001	0.135	-		0.007	0.727	-		-	0.048	-	0.022	-	0.040	-	-	0.005	0.440	0.078	7.16
1	08/08/80	39.6	0.64		3	-	0.029	0.001	0.180	-		0.003	0.328	-		-	-	-	0.025	-	0.043	-	-	0.001	0.267	0.012	5.47
1	08/08/80	37.6	0.60		3	-	0.017	0.001	0.093	-		0.002	0.275	-		-	-	-	0.024	-	0.037	-	-	0.002	0.272	0.022	3.69
1	08/08/80	41.4	0.74		4	-	0.026	-	0.132	-		0.004	0.189	-		-	-	-	0.019	0.001	0.038	-	-	0.003	0.205		2.53
1	08/08/80	39.8	0.66		4	-	0.021	0.001	0.092	-		0.002	0.276	-		-	-	-	0.028	-	0.040	-	-	0.002	0.308	0.014	3.04
1	08/08/80	39.3	0.64		3	-	0.017	0.003	0.104	-		0.003	0.357	-		-	-	-	0.015	-	0.027	-	-	0.002	0.318	0.035	5.01
1	08/08/80	39.2	0.66		3	-	0.036	0.003	0.142	-		0.005	0.400	-		-	0.088	-	0.019	0.001	0.030	-	-	0.006	0.489		4.17

000046

SITE LEGEND

1. Confluence of Crowsnest and Oldman River
2. Below St. Mary Reservoir

APPENDIX
Pesticide and PCB Residue Analysis
All results in mg/kg (ppm)

RIVER/LAKE: St. Mary River

SPECIES: Rocky Mountain Whitefish

- is less than 0.0005 mg/kg (ppm)

Blank: no data

SITE	DATE	FK LG (cm)	WT (kg)	SEX	AGE	HCB		α-BHC		LINDANE		DDE		DDT		DDD		HEPTACHLOR EPOXIDE		DIELDRIN		OXYCHLORDANE		CHLORDANE		PCB	
						muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat	muscle	fat
2	25/08/82	16.8	0.07	M																							
2	25/08/82	17.7	0.08	M		0.001		0.004	0.088	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	25/08/82	18.0	0.08	M																							
2	25/08/82	19.1	0.10	M																							
2	25/08/82	19.6	0.10	M		-	-	0.002	0.074	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-
2	25/08/82	18.6	0.10	M																							
2	25/08/82	20.5	0.14	M																							
2	25/08/82	20.8	0.13	M																							
2	25/08/82	20.7	0.14	F		-	-	0.002	0.071	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	25/08/82	19.5	0.11	F																							
2	25/08/82	20.9	0.14	M																							
2	25/08/82	21.5	0.14	M																							
2	25/08/82	21.6	0.14	M																							
2	25/08/82	21.3	0.15	F		0.001		0.004	0.080	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	25/08/82	21.2	0.15	F																							
2	25/08/82	21.0	0.14	F																							
2	25/08/82	22.2	0.18	M																							
2	25/08/82	22.4	0.14	F		0.001	-	0.005	0.068	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	25/08/82	25.1	0.24	M																							
2	25/08/82	25.0	0.13	F		0.001	-	0.003	0.051	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	25/08/82	24.1	0.23	F																							
2	25/08/82	24.5	0.21	F																							
2	25/08/82	26.1	0.29	M																							
2	25/08/82	26.4	0.27	M		-	-	0.008	0.076	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	25/08/82	28.6	0.35	F		0.001		0.002	-																		

000047